DOCUMENT RESUME

ED 345 403 EC 301 163

AUTHOR Chayo-Dichy, Raquel; And Others
TITLE Dyslexia: An Electrophysiological Approach.
PUB DATE Feb 92
NOTE 7p.; Paper presented at the Annual Meeting of the Inter Neuropsychological Society (20th, San Diego, CA, February 5-8, 1992). Light, dot matrix type.
PUB TYPE Reports - Research/Technical (143) -- Speeches/Conference Papers (150)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Decoding (Reading); *Dyslexia; Electroencephalography; *Etiology; *Expectation; Foreign Countries; Males; Neurological Impairments; *Neurology; *Reading Ability; Verbal Stimuli
IDENTIFIERS *Event Related Potentials

ABSTRACT

This study examined the possibility that expectancy or anticipatory reactions influence the ability to read. The Event Related Potentials (ERPs) of 10 dyslexic Mexican male students (ages 11 to 13) and eight normal male students of the same age range were evaluated. ERPs were measured while the children read words, both in and out of context, that are usually found in either introductory, intermediate, or final positions. The study found significant differences between groups in the amplitude of the ERP recording in the left occipital zone for all conditions when reading in sentences. Results suggest that children with dyslexia may have a possible deficit in stimulus expectancy and/or difficulty in the integration of auditory and visual information and the organization of motor activity. Findings also suggest that the occipital zone participates in the process of decoding verbal material and is affected in subjects with dyslexia. (Five references) (DB)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)
☒ This document has been reproduced as received from the person or organization originating it.
☐ Minor changes have been made to improve reproduction quality.
• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

ED345403

TITLE:

DYSLEXIA: AN ELECTROPHYSIOLOGICAL APPROACH.

AUTHORS:

CHAYO-DICHY RAQUEL (PhD). OSTROSKY-SOLIS FEGGY (PhD). MENESES SERGIO (MSc). HARMONY THALIA (MD). GUEVARA MIGUEL ANGEL (MSc).

DEPARTMENT OF PSYCHOPYSIOLOGY. NATIONAL UNIVERSITY OF MEXICO CITY (U. N. A. M.)

KEYWORDS:
EVENT RELATED POTENTIALS. EVOKED POTENTIALS. CNV. PINV. DYSLEXIA.

ADRESS FOR CORRESPONDENCE:

RAQUEL CHAYO-DICHY
SIERRA FRIA 540
LOMAS DE CHAPULTEPEC 11000
MEXICO, D. F.

Ec 301163

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY
Raquel Chayo-Dichy
TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

BEST COPY AVAILABLE

SUMMARY

Clinical evidence has shown that expectancy or anticipatory reactions influence the ability to read. It is possible that the reading problems shown by dyslexic children could be due to the absence of anticipatory hypotheses when they decode verbal material. Research was therefore carried out into these clinical observations to see if they could be detected on an electrophysiological level using a technique for recording Event Related Potentials (ERPs). In this study, our intention was to observe if there were any differences between a sample population of normal children and one of dyslexic children in the ERPs recorded on the presentation of words both in and out of context. The words recorded during the reading in context were: the word "la" (the feminine article "the" in Spanish), and "intermediate" word and a "final" word in a series of sentences. The first two have a greater anticipatory load than the reading of the final word since this is the word that closes the meaning of the sentence. Furthermore, as a control, the ERPs that were produced when reading isolated words were recorded, a situation that does not require the presence of anticipatory processes. The control group was made up of subjects with adequate school performance and no pathological background, and the experimental group was composed of subjects whose performance on a psychoeducational battery, previously administered to 120 Mexican children, had been found to be two standard deviations below the established norms. Following the 10-20 international system, electrodes were placed in zones F3, Cz, P3, O1 and O2 and referred to both auricular lobes. Statistical analysis revealed significant differences between groups in the amplitude of the ERP recording in the left occipital zone for all conditions when reading in sentences ("la", "intermediate" and "final"). It is suggested that this cortical zone participates in decoding verbal material and that it is deficient in subjects with reading problems.

INTRODUCTION:

Dyslexia is defined as a disturbance shown by the inability to learn to read and that occurs in spite of the subject's having had a satisfactory education, being of average intelligence and coming from a favourable socioeconomic background. It is belived that its origin is a fundamental cognitive problem that is frequently of an organic nature (Critchey,1970). This difficulty is not due to perceptive or acoustico-visual abnormalities, but implies a higher level or a cognitive deficiency.

The use of neurophysiological techniques like Event Related Potentials (ERP) could be a useful tool for the differen- tial diagnosis of this population. In ERP there is a wave known as the contingent negative variation CNV (Walter, 1964). As to the resolution of the CNV, the period following the second stimulus comprises the potential known as the PINV. The CNV has been associated with processes of expectancy and anticipation.

Clinical evidence has shown that anticipatory reaction influence the ability to read (Gibson, 1975). It is possible that the reading problems shown by dyslexic children are due to an absence of anticipatory hypotheses when decoding verbal material. We therefore studied to see if these clinical observations could be detected using the ERP when reading words in sentences and subsequently comparing them with an objective measure of expectancy: the CNV.

We might suggest that in normal subjects the ERP when reading in context would be different according to the position of the word in the sentence. The ERP recorded as a response to the first or the middle word in a sentence would reflect an anticipatory process and would be different to the ERP recorded when the word comes at the end, since there is no anticipation involved in reading the last word. These differences, however, cannot occur with dyslexic subjects since they possibly lack anticipatory hypothesis when they read.

We also recorded the ERP that are produced on reading isolated words, since in this situation, there is no anticipation and therefore the ERP recorded when reading in and out of context should, in theory, be different. Finally, we studied the differences between the normal and the dyslexic subjects.

METHOD.

SUBJECTS:

The experimental group included ten right handed males aged between 11 and 13 (mean, 12.2). They were selected from a center for the diagnosis and treatment of children with commmunication disorders (INCH National Institute for Human Communication). The children were to have no neurological alteration, they had adequate sensory acuteness, average intelligence (as measured on the Wechsler scale) and were classified as coming from an average socioeconomic background (according to INCH's questionnaires). The control group was made up of eight right-handed males aged 11 to 13 (mean, 11.9).

PROCEDURE:

A psychoeducational battery (Ostrosky-Solis,1984) was applied to all subjects. It had previously been administered to a sample of 120 Mexican children and evaluated comprehension and oral expression, reading, arithmetic and visual and auditory processing. The children were classified as dyslexic when their performance on the reading test were two standard deviations below the standarized norms.

In the first situation the response was recorded to the paradigm of CNV (Walter,1964) The subjects were presented with a pair of stimulus separated by a random interval,the first stimulus was a tone of 50 Hz and 50ms duration that anticipated the appeareance of a flash of 50 ms on a computer screen.The subjects pressed a key each time the flash appeared. The evoked response arising from the imperative stimulus (S2) was recorded. During this interval, it was possible to observe the return to the base line from the CNV situation; this wave is known as the PINV.

In the second situation, the syllable "LA" and different isolated words out of context were projected to obtain the potential produced in response to the reading of words with no determined sequence, and to use these potentials as a control of what would happen in reading when there are no anticipatory elements due to lack of context.

In the third situation, reading in context, we presented 4 stories. The subject was told that a story would appear on the computer screen. For a sentence like: The girl went to school, three types of verbal stimuli were chosen. First,the ERP were recorded for the article "The" it constitutes a purely anticipatory element. As the second verbal stimulus, intermediate words were averaged (went). Finally, the last words in a sentence were averaged; these in theory do not produce expectancy (school).

Electrodes were placed at F3,Cz,P3,O1, all referenced to linked mastoides. Impedances were measured at the beginning and end of each session. The bandpass was 0.01-30 Hz and the averaging epoch was 1024 ms. Individual trials with excessive muscular activity or eye blinks were excluded.

Comparisons of the ERP amplitude between groups, conditions and derivations were carried out by means of an analysis of variance ANOVA. Significant differences were analyzed using the Tukey procedure for comparisons.

RESULTS:

Significant differences between groups in the amplitude of the CNV wave in the left parietal zone were found (F 1, 17.) = 6.81, p = 0.018, also in the amplitude of the PINV wave in the same zone (F (1,17.) = 7.42, p = 0.014. Similarly, differences were found in the ERP recorded in the left occipital zone on reading in all the different conditions in context. (F (1,17.) 6.91, p = 0.017. With regard to the comparisons of the context and the no context condition we did not find significant results. Also we did not find intragroupal differences.

DISCUSSION:

The decrease in the CNV and in PINV observed in dyslexic subjects could suggest a deficit in stimulus expectancy. Given that the differences were found in the angular gyrus, the results could indicate that there is some difficulty in the integration of auditory and visual information and the organization of the motor activity.

The differences found between groups in the reading task, suggest that the occipital zone participates in the process of decoding verbal material and is affected in the dyslexic subjects.

These differences may be due to the strategies in which the subjects approach the task, supporting Torgensen's (1977) hypothesis which suggests that deficits in performance presented by dyslexic children may be due to a failure to adopt active strategies during the reading process. These children fail to find active, organized approaches to do the task and therefore they are inefficient subjects in the reading process.

REFERENCES:

- Critchley M. 1970. The dyslexic child. Springfield. Charles Thomas.

- Gibson E. Levy H. 1975. The Psychology of Reading. Cambridge: MIT Press.

- Ostrosky-Solis, F., Navarro, M.E., Canseco, E. 1984. La lectura, perfiles cognoscitivos en México. Rev. Mexicana Psicología. Vol. 1,53.

- Torgensen J.K. 1977. The role at specific factors in the task performance of learning disabled children: A theorical assesment. Journal of learning disabilities 10, 17-34.

- Walter, W., Cooper, R., Aldridjie V, McCallum W., Winter. 1964. CNV an electric sign of expectancy in the human brain. Nature 203,380-384.